Technical Note No. 34 August 23, 1939

OUTLINE FOR COMPILING PRECIPITATION AND RUNOFF DATA FROM SMALL DRAINAGE AREAS

Prepared by the

Division of Forest Influences

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Forest Service

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This outline is issued in mimeographed form in order to meet numerous urgent requests on the Station for this type of information. Moreover, final publication is undesirable until further suggestions for improvement have been sought. Such criticism will be welcomed.

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FOREWORD

Studies of small drainage areas, directed toward finding out the relationships between land management practices and water resources, are receiving increasing attention throughout the United States as a part of the national consciousness for conservation of basic natural resources. Small drainage area studies will furnish the basis for an intelligent management of water from the time it falls on the land as precipitation. They will serve as a basis on which to plan for water conservation for agricultural needs, for municipal and industrial uses, and for recreational uses of our streams.

A complete accounting for all forms of water recharge and water discharge for any drainage area would require a thorough analysis of all phases of the hydrologic cycle including precipitation losses due to interception by vegetative canopies, evaporation and transpiration discharges, soil moisture retention and all forms of ground water seepage. Many years of systematic research will be required before all of these phases of the hydrologic cycle will be accounted for accurately. Fortunately, certain of the more easily measured phases do furnish a fairly reliable basis for interpreting important trends in the water economy of small drainage areas. Two such measurements are precipitation recharge and runoff. These two measurements are the primary steps in all small drainage area studies. They also assist in orienting the research needs for other less easily measured phases of the hydrologic cycle.

This outline describes a procedure for systematic compilation of data for continuous records of precipitation and of stream discharges. It is based on experience with small drainage areas in the Southern Appalachian Mountains. For the further analysis of data it has been found advantageous to compile all records by six month periods corresponding to the growing and dormant seasons. Accordingly, the periods from May 1 to October 31 and November 1 to April 30 have been adopted as the growing and dormant seasons for the purposes of compilation and analysis of hydrologic data.

In June 1938 a preliminary outline was circulated for comment to a number of workers in the field of small drainage area studies and numerous valuable suggestions for improvements have been received. Since that time standard forms have been adopted for reporting mass precipitation and stream discharge to be used in exchanging data among different workers. In this revised outline these forms have been used wherever they are applicable.

Certain procedures discussed in the first issue of the outline, for example, that of determining infiltration from observed storms by use of the "rainfall excess" method, which more nearly fall under the heading of data analysis than compilation, have been deleted. Such procedures can be more adequately treated under a special outline for the analysis of hydrological data for small drainage areas.

The preliminary outline was assembled by L. K. Hill, Associate Civil Engineer, and K. A. MacKichan, Junior Hydraulic Engineer. The present revision has been made largely by R. A. Hertzler, Assistant Hydraulic Engineer, and Miss Inez Willoughby, Junior Statistical Clerk. Important suggestions as to the form of the present outline have also been made by H. J. Loughead, Associate Conservationist, and E. F. Brater, Assistant Hydraulic Engineer.

Actually, the outline represents the efforts of both field and office staff of the Division of Forest Influences at the Appalachian Forest Experiment Station, for without continuous field records such an outline could not have been developed.

C. R. HURSH,
Senior Forest Ecologist.

Note: Assistance in the preparation of these materials was furnished by the personnel of Works Progress Administration Official Project No. 701-3-21.

STANDARD RAIN GAGE RECORDS
Form 1

Purpose

The tabulation of precipitation amounts measured by standard rain gages is given in this form.

Procedure

The original data as collected after each storm period are copied from the observer's field notebook and consist of the following: date of storm period, date observer measured the precipitation, amount of precipitation in inches, and time of day each standard rain gage was measured.

At the end of each month the total precipitation is recorded, all entries checked against the observer's field notebook, and the form filed.

RI-AP
Forests on Streamflow
Precipitation

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Forest Service

Form 1

STANDARD RAIN GAGE RECORDS

Experimental area: _____ Observed by: _____ Computed by: _____ Checked by: _____

Date of storm	Date of reading	Gage No. __		Gage No. __		Gage No. __		Gage No. __		Gage No. __		Gage No. __		Remarks
		Inches	Time*	Inches	Time	Inches	Time	Inches	Time	Inches	Time	Inches	Time	
Monthly total														

* Observations are made from 7:00 a.m. to 7:00 p.m. unless otherwise stated.

Month _____ Year _____

Sheet ___ of ___ sheets

RI-AP
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Precipitation

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Form 1

STANDARD RAIN GAGE RECORDS

Experimental area: Coweeta

Observed by: C.C.C. Computed by: Hall Checked by: R.A.H.

Date of storm	Date of reading	Gage No. 12		Gage No. 17		Gage No. 25		Gage No. 18		Gage No. 21		Gage No. 20		Remarks
		Inches	Time*	Inches	Time	Inches	Time	Inches	Time	Inches	Time	Inches	Time	
Sept.	Sept.													
3	4	1.10	12:20	1.21	1:05	1.11	12:05	1.21	1:35	1.21	1:50	1.26	2:35	
12-15	15	0.12	10:50	0.23	1:15	0.34	10:35	0.12	1:50	0.16	2:00	0.25	3:00	
20	21	1.80	12:15	1.90	1:25	1.40	12:00	2.00	1:50	1.85	2:10	1.88	2:30	
24	25	0.49	12:20	0.55	1:30	0.56	12:00	0.57	1:40	0.60	2:15	0.56	2:40	
29	29	0.35	12:25	0.36	12:55	0.41	12:10	0.37	1:00	0.44	1:20	0.44	2:20	
29-30	Oct. 1	5.94	10:45	6.16	1:15	5.30	10:30	6.08	1:45	5.90	2:00	5.94	3:00	
Monthly total		9.80		10.41		9.12		10.35		10.16		10.33		

* Observations are made from 7:00 a.m. to 7:00 p.m. unless otherwise stated.

Month September Year 1936

Sheet 1 of 1 sheets

RECORD OF WEIGHTED MEAN PRECIPITATION
ON AN INDIVIDUAL DRAINAGE BASIN
Form 2

Purpose

As most drainages require more than one gage for adequate sampling, precipitation in area inches is derived from a weighted mean of all gage measurements. Form 2 is used for this computation for individual storms.

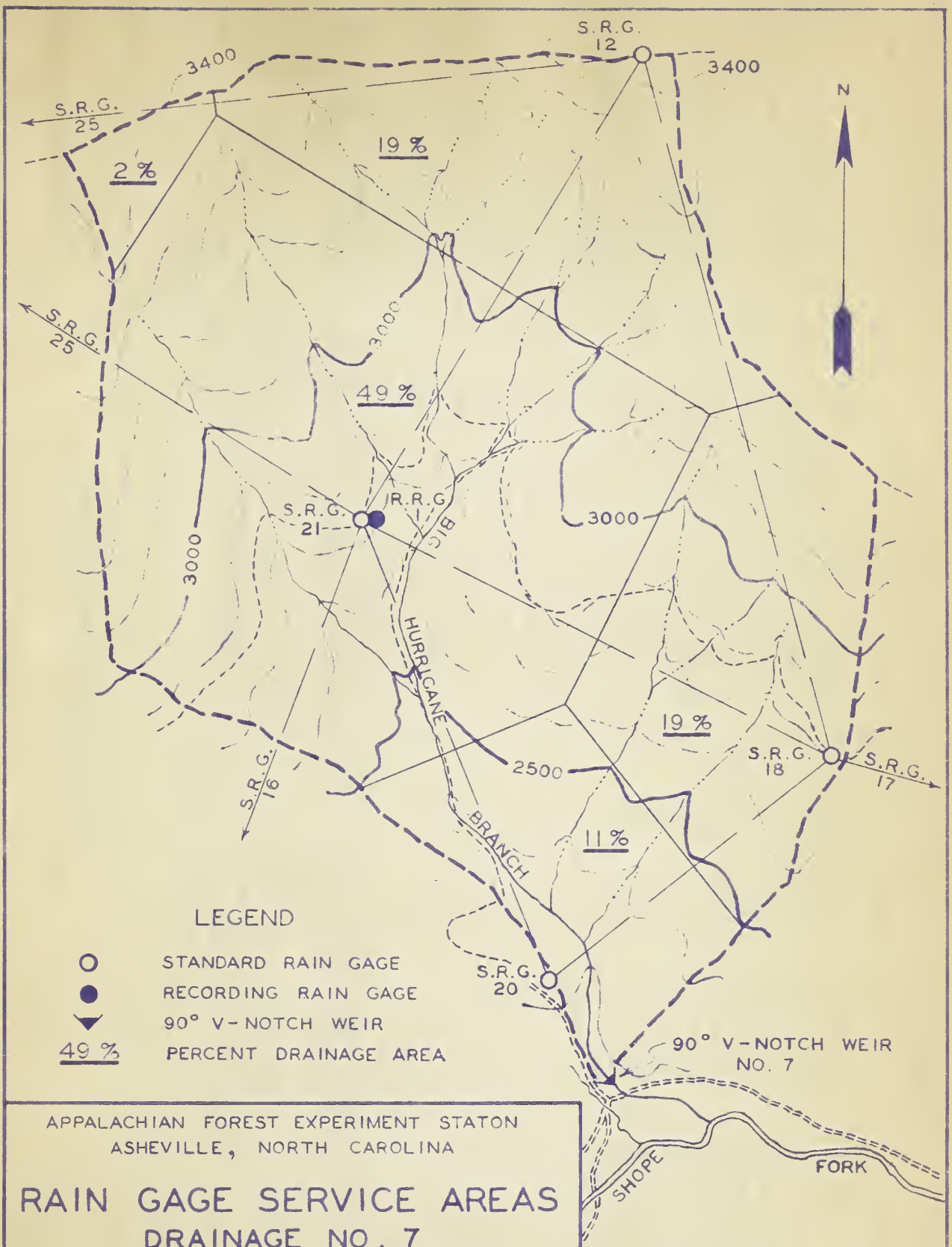
Procedure

The Horton-Thiessen Mean Method[1/] used for the estimating of area inches of precipitation consists of applying to each standard rain gage reading a weight factor which is the percentage of the total drainage area lying closer to this gage than to any other gage.

The rain gage service area, represented by each standard rain gage, is determined by geometrical construction and planimetering. Each gage reading is applied to an area bounded by either the perpendicular bisectors of the lines connecting each gage to adjacent gages, or by the boundary of the drainage area, or by both. The method of determining rain gage service areas is shown on plate 1.

The standard rain gage (S.R.G.) number and its weight factor are listed in the first and second columns of form 2. In the remaining 14 columns are recorded individual storms, each storm requiring two columns. The amount of precipitation for each gage is recorded in the first column, the product of weight factor and amount of precipitation in the second. The sum of the amounts in the second column is the weighted mean precipitation on the drainage basin in area inches for the individual storms.

1/ Horton, Robert E. 1923. Accuracy of areal rainfall estimates. Mo. Wea. Rev. 51:348-353.



APPALACHIAN FOREST EXPERIMENT STATON
ASHEVILLE, NORTH CAROLINA

RAIN GAGE SERVICE AREAS

DRAINAGE NO. 7

COWEETA EXPERIMENTAL FOREST

SCALE: 1" = 500 FT.

500 0 500

CONTOUR INTERVAL 100 FEET

AREA = 145.5 ACRES

PLATE 1

RI-AP
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Form 2

RECORD OF WEIGHTED MEAN PRECIPITATION ON AN INDIVIDUAL DRAINAGE BASIN

Experimental area: _____ Computed by: _____
Drainage basin No.: ____ Area _____ acres Checked by: _____

St'd rain gage	Weight factor	Date of storms													
		S.R.G.	S.R.G. x Factor	S.R.G.	S.R.G. x Factor	S.R.G.	S.R.G. x Factor	S.R.G.	S.R.G. x Factor	S.R.G.	S.R.G. x Factor	S.R.G.	S.R.G. x Factor	S.R.G.	S.R.G. x Factor
No.	Pct.	In.	In.	In.	In.	In.	In.	In.	In.	In.	In.	In.	In.	In.	In.
Totals area inches															

Period: _____ to _____ Sheet ___ of ___ sheets

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Form 2

RECORD OF WEIGHTED MEAN PRECIPITATION ON AN INDIVIDUAL DRAINAGE BASIN

Experimental areas: Coweeta
Drainage basin No. 7 Area 145.5 acres

Computed by: H.K.S.
Checked by: A.C.

St'd rain gage	Weight factor	Date of storms: Sept. 3		Sept. 12-15		Sept. 20		Sept. 24		Sept. 29		Sept. 29-30		Oct. 5-8	
		S.R.G.	S.R.G. x Factor	S.R.G.	S.R.G. x Factor	S.R.G.	S.R.G. x Factor	S.R.G.	S.R.G. x Factor	S.R.G.	S.R.G. x Factor	S.R.G.	S.R.G. x Factor	S.R.G.	S.R.G. x Factor
No.	Pct.	In.	In.	In.	In.	In.	In.	In.	In.	In.	In.	In.	In.	In.	In.
12	19	1.10	0.21	0.12	0.02	1.80	0.34	0.49	0.09	0.35	0.07	5.94	1.13	0.88	0.17
18	19	1.21	0.23	0.12	0.02	2.00	0.38	0.57	0.11	0.37	0.07	6.08	1.16	0.73	0.14
20	11	1.26	0.14	0.25	0.03	1.88	0.21	0.61	0.07	0.44	0.05	5.94	0.65	0.83	0.09
21	49	1.21	0.59	0.16	0.08	1.85	0.91	0.60	0.29	0.44	0.22	5.90	2.89	0.92	0.45
25	2	1.11	0.02	0.34	0.01	1.40	0.03	0.56	0.01	0.41	0.01	5.30	0.11	1.15	0.02
Totals area inches			1.19		0.16		1.87		0.57		0.42		5.94		0.87

Period: September 3 to October 8, 1936

Sheet 1 of 1 sheets

RECORDING RAIN GAGE RECORD
Form 3

Purpose

On this form is shown a continuous record of rainfall for individual storms as recorded by a single recording rain gage, and also as corrected for the rainfall collected in a standard rain gage which in each case is installed beside the recording gage. The purpose of this form is to tabulate data for an accurate reproduction of recorded precipitation and to compile precipitation intensity data.

Procedure

A storm is considered as a period of precipitation separated by at least 6 hours from any other period in which precipitation occurs. The times of beginning and ending of the precipitation are indicated on the recorded chart by the symbols, P.B., and P.E., respectively (plate 2).

Two sheets are used. The first sheet (form 3) has a heading for a description of the precipitation station and is used only as the first sheet of a six-month period. For all storms thereafter in that period the second sheet (form 3a) which has very little heading is used.

Column 1. Date of rainfall.

Column 2. Time of change in rainfall intensity. The time is read from the recorder chart at the points where significant changes in rainfall rates occur. Such points are called natural breaks.

Column 3. Time interval in minutes between natural breaks in rainfall intensity. Intervals are always read to the smallest time interval that can be determined with a reasonable degree of accuracy from the individual recorder chart.

Column 4. Accumulated rainfall in inches at the end of each time interval. The amount is read from the rainfall chart and is corrected before recording for instrumental errors, such as pen reversal, base line errors, etc.

Column 5. The accumulated recorded rainfall is corrected to the standard rain gage catch as measured in the gage placed beside the recording gage. The correction factor, as noted on the bottom of the form, is the standard rain gage reading divided by the total recorded rainfall. Figures in column 4 multiplied by this factor are the corrected values shown in column 5.

Column 6. The corrected rainfall increment in inches for the time interval. In this column are recorded differences between successive values in column 5.

Column 7. If desired the increment for regular intervals, such as 5, 10, 15, etc. minutes, may be computed from columns 3 and 5. This column is not filled in unless requested for some specific purpose.

To use column 7 it is necessary to show in column 2 additional times corresponding to the regular interval.

Column 8. Rainfall rate in inches per hour for the time interval. $\frac{\text{Col. 6 x 60 min.}}{\text{Col. 3}}$ = column 8.

Column 9. Rainfall rate in inches per hour for the regular time interval. $\frac{\text{Col. 7 x 60 min.}}{\text{regular interval}}$ = column 9.

Column 10. Notes of beginning and ending of rainfall (P.B. and P.E.) recorded opposite times shown in column 2. This column is also used for pertinent comments noticed during computations.

Bottom of form. The figures used in determining the correction factor are recorded on the proper lines and the standard rain gage number is inserted in the space provided.

The rainfall class defines pertinent characteristics required for analysis of data. It is an expression of four terms where each term is a class number. The terms are given in the following order:

First: Total rainfall.

Second: Maximum 5-minute intensity.

Third: Maximum 20-minute intensity.

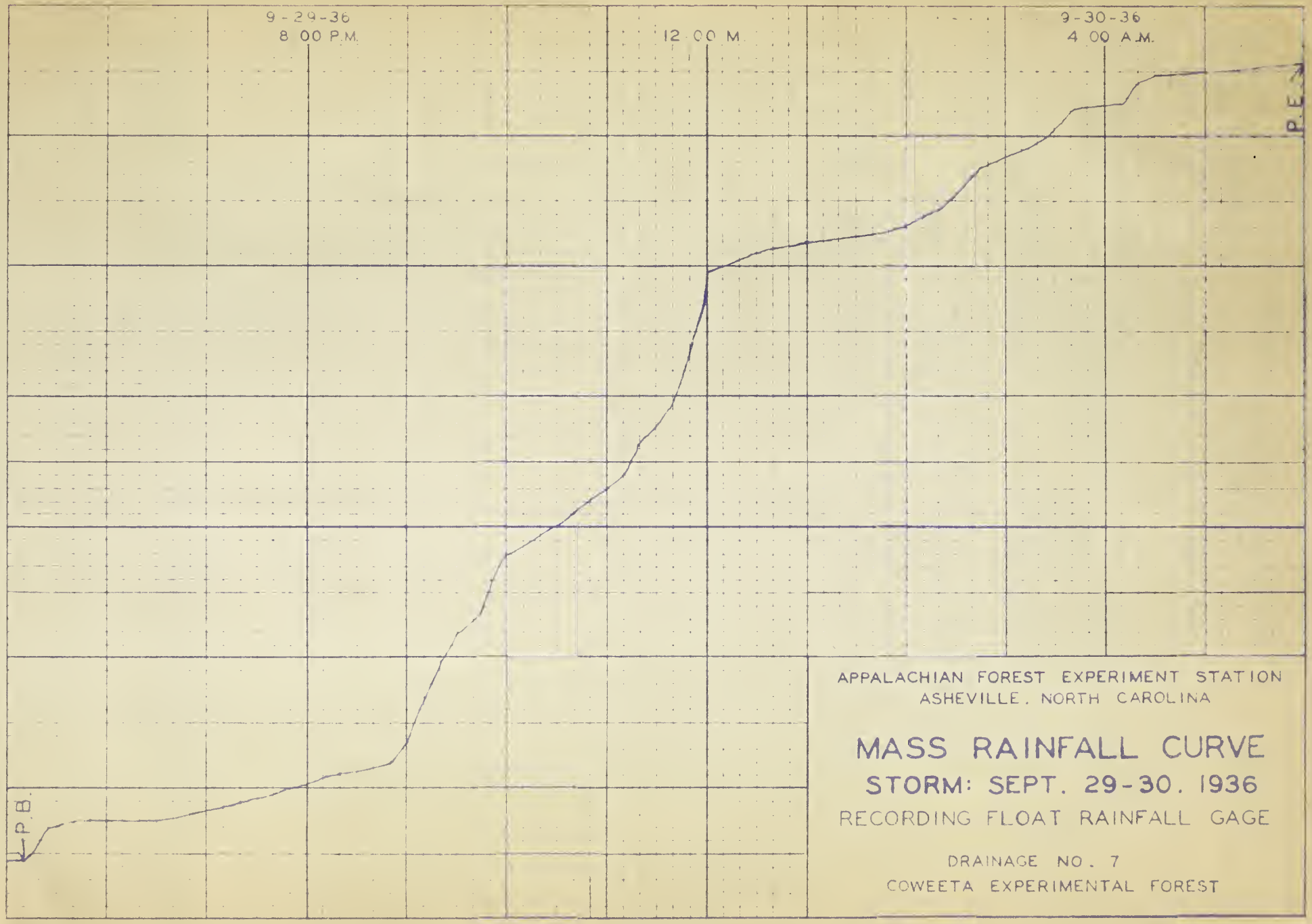
Fourth: Duration to the nearest hour.

The first three terms employed are based on the arbitrary class numbers listed below; the fourth term needs no explanation.

Key to class numbers

First term		Second and third terms	
Class No.	Total rainfall Inches	Class No.	Rate per hour Inches
0	0 - .49	0	0 - .49
1	.50 - .99	1	.50 - .99
2	1.00 - 1.99	2	1.00 - 1.99
3	2.00 - 3.99	3	2.00 - 3.99
4	4.00 - 7.99	4	4.00 - 7.99
5	8.00 - Up	5	8.00 - Up

Maximum rainfall depths and intensities in inches per hour are recorded for selected rainfall durations in minutes. These rates are obtained from the original charts by considering each interval as a continuous time unit. With a little experience the maximum depths for the various time intervals can be readily taken from the chart with a pair of dividers.



APPALACHIAN FOREST EXPERIMENT STATION
ASHEVILLE, NORTH CAROLINA

MASS RAINFALL CURVE

STORM: SEPT. 29-30. 1936

RECORDING FLOAT RAINFALL GAGE

DRAINAGE NO. 7
COWEETA EXPERIMENTAL FOREST

PLATE 2

RI-AP
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Precipitation

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Form 3
File No. _____

RECORDING RAIN GAGE RECORD

Rain gage No. ___ Type _____
1 inch on chart = _____" of precipitation
1 inch on chart = _____ min. or hr.
(Cross out one)
Time standard: EST CST MST PST
(Cross out others)
Elevation: (M.S.L.) _____

_____
(Station designation)
Lat.: ___° ___' ___": Long.: ___° ___' ___"
Sec.: _____, Tp. _____, Range _____
Dates: _____ 19 _____
Station description is -- is not -- available upon request. (Cross out one)

Date	Time	Time interval	Accumulated depth		Depth for		Intensity for		Remarks
			Recorded	Corrected	Each time interv.	Regular time interv.	Each time interv.	Regular time interv.	
1	2	3	4	5	6	7	8	9	10
	Hr:min.	Min.	In.	In.	In.	In.	In./hr.	In./hr.	

Correction factor = $\frac{\text{S.R.G. No.}}{\text{Recorded depth}}$ = = Rainfall class: _____

MAXIMUM DEPTH AND INTENSITY FOR SELECTED TIME INTERVALS

Duration min.	2	5	10	15	20	30	60	120	240	6 hr.	12 hr.
Depth in.											
Intensity in./hr.											

Tabulated by: _____ Date _____ Checked by: _____ Date _____
Computed by: _____ Date _____ Checked by: _____ Date _____
Sheet ___ of ___ sheets

RI-AP
Forests on Streamflow
Precipitation

U. S. Department of Agriculture
Forest Service

Form 3a
File No. ______

RECORDING RAIN GAGE RECORD

Rain gage No. ________ Station designation: ______________

Date	Time	Time interval	Accumulated depth		Depth for		Intensity for		Remarks
			Recorded	Corrected	Each time interv.	Regular time interv.	Each time interv.	Regular time interv.	
1	2	3	4	5	6	7	8	9	10
	Hr:min.	Min.	In.	In.	In.	In.	In./hr.	In./hr.	

Correction factor = $\frac{\text{S.R.G. No.}}{\text{Recorded depth}}$ = = Rainfall class: ______

MAXIMUM DEPTH AND INTENSITY FOR SELECTED-TIME INTERVALS --

Duration min.	2	5	10	15	20	30	60	120	240	6 hr.	12 hr.
Depth in.											
Intensity in./hr.											

Tabulated by: ________ Date ________ Checked by: ________ Date ________
Computed by: ________ Date ________ Checked by: ________ Date ________
Sheet ___ of ___ sheets

RI-AP
Forests on Streamflow
Precipitation

U. S. Department of Agriculture
Forest Service

Form 3a
File No. _____

RECORDING RAIN GAGE RECORD

Rain gage No. 1 Station designation: Cowee to

Date	Time	Time interval	Accumulated depth		Depth for		Intensity for		Remarks
			Recorded	Corrected	Each time interv.	Regular time interv.	Each time interv.	Regular time interv.	
1	2	3	4	5	6	7	8	9	10
	Hr:min.	Min.	In.	In.	In.	In.	In./hr.	In./hr.	
Sept.29	5:10p		0.00	0.00					P.B. 5:10 p.
1936	5:15	5	0.07	0.07	0.07		0.84		
	5:25	10	0.27	0.26	0.19		1.14		
	5:40	15	0.31	0.30	0.04		0.16		
	6:30	50	0.32	0.31	0.01		0.01		
	6:50	20	0.36	0.35	0.04		0.12		
	8:20	90	0.69	0.68	0.33		0.22		
	8:50	30	0.76	0.74	0.06		0.12		
	9:00	10	0.92	0.90	0.16		0.96		
	9:05	5	1.07	1.05	0.15		1.80		
	9:20	15	1.49	1.46	0.41		1.64		
	9:30	10	1.72	1.69	0.23		1.38		
	9:45	15	1.87	1.83	0.14		0.56		
	9:50	5	2.05	2.01	0.18		2.16		
	9:55	5	2.27	2.22	0.21		2.52		
	10:00	5	2.35	2.30	0.08		0.96		
	10:40	40	2.63	2.58	0.28		0.42		
	11:10	30	2.93	2.87	0.29		0.58		
	11:20	10	3.20	3.14	0.27		1.62		
	11:40	20	3.50	3.43	0.29		0.87		
	11:50	10	3.87	3.79	0.36		2.16		
	11:55	5	4.12	4.04	0.25		3.00		
	12:00	5	4.40	4.31	0.27		3.24		
Sept.30	12:30a	30	4.57	4.48	0.17		0.34		
	1:00	30	4.66	4.57	0.09		0.18		
	2:00	60	4.80	4.70	0.13		0.13		
	2:20	20	4.90	4.80	0.10		0.30		
	2:45	25	5.22	5.12	0.32		0.77		
	3:25	40	5.47	5.36	0.24		0.36		
	3:40	15	5.68	5.57	0.21		0.84		
	3:50	10	5.71	5.60	0.03		0.18		

Correction factor = $\frac{\text{S.R.G. No. 21}}{\text{Recorded depth}} = \frac{5.90}{6.02} = .980$ Rainfall class: 4-3-3-13

MAXIMUM DEPTH AND INTENSITY FOR SELECTED TIME INTERVALS

Duration min.	2	5	10	15	20	30	60	120	240	6 hr.	12 hr.
Depth in.		0.28	0.52	0.71	0.87	1.03	1.52	1.99	3.72	4.38	5.84
Intensity in./hr.		3.36	3.12	2.84	2.61	2.06	1.52	1.00	0.93	0.73	0.49

Tabulated by: H.K.S. Date June 1938 Checked by: K.A.M. Date June 1938
Computed by: I.W. Date June 1939 Checked by: A.C. Date June 1939

Sheet 1 of 2 sheets

RI-AP
Forests on Streamflow
Precipitation

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Forest Service

Form 3a
File No. _____

RECORDING RAIN GAGE RECORD

Rain gage No. 1 Station designation: Coweeta

Date	Time	Time interval	Accumulated depth		Depth for		Intensity for		Remarks
			Recorded	Corrected	Each time interv.	Regular time interv.	Each time interv.	Regular time interv.	
1	2	3	4	5	6	7	8	9	10
	Hr:min.	Min.	In.	In.	In.	In.	In./hr.	In./hr.	
Sept. 30	4:10a	20	5.72	5.61	0.01		0.03		
1936	4:20	10	5.89	5.77	0.16		0.96		
	4:30	10	5.94	5.82	0.05		0.30		
	6:00	90	6.02	5.90	0.08		0.05		P.E. 6:00 a.
	Total	12:50			5.90				

Correction factor = $\frac{\text{S.R.G. No.}}{\text{Recorded depth}}$ = = Rainfall class: _____

MAXIMUM DEPTH AND INTENSITY FOR SELECTED TIME INTERVALS

Duration min.	2	5	10	15	20	30	60	120	240	6 hr.	12 hr.
Depth in.											
Intensity in./hr.											

Tabulated by: _____ Date _____ Checked by: _____ Date _____
Computed by: _____ Date _____ Checked by: _____ Date _____

Sheet 2 of 2 sheets

PRECIPITATION INTENSITY RECORD
(Case 1 - Drainage basins with one recording precipitation gage)
Form 4

Purpose

This form is used to record weighted precipitation intensities for an individual drainage basin having only one recording precipitation gage. Intensities are recorded by individual storms which are defined under "Procedure" on page 10.

Procedure

Columns 1, 2, 3, & 4. These columns are copied directly from the corresponding columns of form 3 or 3a for the same storm.

Column 5. To obtain column 5 the figures of column 4 are each multiplied by the factor which corrects the recorded rainfall to the weighted mean rainfall for the drainage basin. The correction factor is obtained, as shown on the bottom of the form, by dividing the weighted mean rainfall by the total recorded rainfall. The weighted mean rainfall (W.M.R.) is copied from form 2 and the recording rain gage (R.R.G.) rainfall is the total accumulated rainfall at the end of the storm, column 4.

Column 6. The increments of rainfall, or the differences between successive accumulated amounts, as shown in column 5, are recorded in column 6.

Column 7. The increments of column 6 are converted into rainfall rates in inches per hour for the time interval. $\frac{\text{Col. 6 x 60 min.}}{\text{Col. 3}}$ = column 7.

Column 8. Show in column 8 the time when precipitation begins and ends (P.B. and P.E.) and in addition any notes or remarks pertinent to the entire record.

Bottom of form. Actual values used in computing the correction factor are inserted in the proper space according to the method explained under "column 5". The rainfall class is not copied from form 3, but is recalculated as described under "form 3". Maximum depths and intensities for selected time intervals are computed as explained under "form 3".

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Form 4

PRECIPITATION INTENSITY RECORD
(Case 1)

Rain gage No. ___ Type _____
1 inch on chart = _____" of precipitation
1 inch on chart = _____ min. or hr.
(Cross out one)
Dates: _____ 19 __
Time standard: EST CST MST PST
(Cross out others)
Elevation: (M.S.L.) _____

Experimental area: _____
Drainage basin No. _____
Area: _____ acres
Lat.: __° __' __": Long.: __° __' __"
Sec.: _____, Tp. _____, Range _____
Station description is -- is not --
available upon request. (Cross out one)

Date	Time	Time interval	Accumulated depth		Increment	Rate per hour	Remarks
			Recorded	Corrected			
1	2	3	4	5	6	7	8
	Hr:min.	Min.	In.	In.	In.	In./hr.	

Correction factor = $\frac{\text{W.M.R.}}{\text{R.R.G.}}$ = = Rainfall class: _____

MAXIMUM DEPTH AND INTENSITY FOR SELECTED TIME INTERVALS --

Duration min.	2	5	10	15	20	30	60	120	240	6 hr.	12 hr.
Depth in.											
Intensity in./hr.											

Tabulated by: _____ Date _____ Checked by: _____ Date _____
Computed by: _____ Date _____ Checked by: _____ Date _____
Sheet ___ of ___ sheets

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Form 4a

PRECIPITATION INTENSITY RECORD
(Case 1)

Experimental area: ____________________ Drainage basin No. ____________
Recording rain gage No. ______________ Area: ____________________ acres

Date	Time	Time interval	Accumulated depth		Increment	Rate per hour	Remarks
			Recorded	Corrected			
1	2	3	4	5	6	7	8
	Hr:min.	Min.	In.	In.	In.	In./hr.	

Correction factor $= \frac{\text{W.M.R.}}{\text{R.R.G.}} =$ $\quad =$ Rainfall class: ____________

MAXIMUM DEPTH AND INTENSITY FOR SELECTED TIME INTERVALS

Duration min.	2	5	10	15	20	30	60	120	240	6 hr.	12 hr.
Depth in.											
Intensity in./hr.											

Tabulated by: ____________ Date ____________ Checked by: ____________ Date ____________
Computed by: ____________ Date ____________ Checked by: ____________ Date ____________
Sheet ___ of ___ sheets

RI-AP
Forests on Streamflow
Precipitation

U. S. Department of Agriculture
Forest Service

Form 4a

PRECIPITATION INTENSITY RECORD
(Case 1)

Experimental area: Coweeta
Recording rain gage No. 1

Drainage basin No. 7
Area: 145.5 acres

Date	Time	Time interval	Accumulated depth		Increment	Rate per hour	Remarks
			Recorded	Corrected			
1	2	3	4	5	6	7	8
	Hr:min.	Min.	In.	In.	In.	In./hr.	
Sept. 29	5:10p		0.00	0.00			P.B. 5:10 p.
1936	5:15	5	0.07	0.07	0.07	0.84	
	5:25	10	0.27	0.27	0.20	1.20	
	5:40	15	0.31	0.31	0.04	0.16	
	6:30	50	0.32	0.32	0.01	0.01	
	6:50	20	0.36	0.35	0.03	0.09	
	8:20	90	0.69	0.68	0.33	0.22	
	8:50	30	0.76	0.75	0.07	0.14	
	9:00	10	0.92	0.91	0.16	0.96	
	9:05	5	1.07	1.06	0.15	1.80	
	9:20	15	1.49	1.47	0.41	1.64	
	9:30	10	1.72	1.70	0.23	1.38	
	9:45	15	1.87	1.84	0.14	0.56	
	9:50	5	2.05	2.02	0.18	2.16	
	9:55	5	2.27	2.24	0.22	2.64	
	10:00	5	2.35	2.32	0.08	0.96	
	10:40	40	2.63	2.59	0.27	0.41	
	11:10	30	2.93	2.89	0.30	0.60	
	11:20	10	3.20	3.16	0.27	1.62	
	11:40	20	3.50	3.45	0.29	0.87	
	11:50	10	3.87	3.82	0.37	2.22	
	11:55	5	4.12	4.06	0.24	2.88	
	12:00	5	4.40	4.34	0.28	3.36	
Sept. 30	12:30a	30	4.57	4.51	0.17	0.34	
	1:00	30	4.66	4.59	0.08	0.16	
	2:00	60	4.80	4.73	0.14	0.14	
	2:20	20	4.90	4.83	0.10	0.30	
	2:45	25	5.22	5.15	0.32	0.77	
	3:25	40	5.47	5.39	0.24	0.36	
	3:40	15	5.68	5.60	0.21	0.84	

Correction factor = $\frac{\text{W.M.R.}}{\text{R.R.G.}} = \frac{5.94}{6.02} = .987$

Rainfall class: 4-3-3-13

MAXIMUM DEPTH AND INTENSITY FOR SELECTED TIME INTERVALS

Duration min.	2	5	10	15	20	30	60	120	240	6 hr.	12 hr.
Depth in.		0.28	0.52	0.71	0.88	1.04	1.53	2.00	3.75	4.41	5.88
Intensity in./hr.		3.36	3.12	2.84	2.63	2.09	1.53	1.00	0.94	0.74	0.49

Tabulated by: H.K.S. Date June 1938 Checked by: K.A.M. Date June 1938
Computed by: H.K.S. Date June 1938 Checked by: K.A.M. Date June 1938

Sheet 1 of 2 sheets

RI-AP
Forests on Streamflow
Precipitation

U. S. Department of Agriculture
Forest Service

Form 4a

PRECIPITATION INTENSITY RECORD
(Case 1)

Experimental area: Coweeta
Recording rain gage No. 1

Drainage basin No. 7
Area: 145.5 acres

Date	Time	Time interval	Accumulated depth		Increment	Rate per hour	Remarks
			Recorded	Corrected			
1	2	3	4	5	6	7	8
	Hr:min.	Min.	In.	In.	In.	In./hr.	
Sept. 30	3:50a	10	5.71	5.63	0.03	0.18	
1936	4:10	20	5.72	5.64	0.01	0.03	
	4:20	10	5.89	5.81	0.17	1.02	
	4:30	10	5.94	5.86	0.05	0.30	
	6:00	90	6.02	5.94	0.08	0.05	P.E. 6:00 a.
	Total	12:50			5.94		

Correction factor = $\frac{\text{W.M.R.}}{\text{R.R.G.}}$ = = Rainfall class:

MAXIMUM DEPTH AND INTENSITY FOR SELECTED TIME INTERVALS –

Duration min.	2	5	10	15	20	30	60	120	240	6 hr.	12 hr.
Depth in.											
Intensity in./hr.											

Tabulated by: _____ Date _____ Checked by: _____ Date _____
Computed by: _____ Date _____ Checked by: _____ Date _____

Sheet 2 of 2 sheets

WEIGHTED PRECIPITATION INTENSITY RECORD
(Case 2 - Drainage basins with more than one recording precipitation gage)
Form 5

Purpose

This form is used for the computation of weighted mean precipitation intensity for individual drainage basins having more than one recording rain gage either within or near the boundary. Form 5 is executed for individual storms as defined under "Procedure" on page 10.

Procedure

There are from 5 to 8 recording precipitation gages on each experimental area so the service areas and weight factors for each recording gage must be determined. The procedure is identical with that described under "Procedure" for standard rain gages (form 2) on page 6. An example of the method for determining recording precipitation gage service areas is presented as plate 3. In this example the portions of service areas for gages 2, 4, and 6 falling within drainage basin No. 8 are too small to make a significant difference in the rainfall rates for area 8. In such cases the weighted factors for the significant gages are increased proportionately to include these small areas. The method of combining intensities of the several recording gages for a given time interval consists of: 1. correcting the recorded values to the standard rain gage reading, 2. weighing this corrected value according to the proportional or service areas covered by each gage, and 3. correcting the sum of the weighted values for each interval to the weighted mean precipitation for the drainage as determined on form 2.

The recorded values in columns 3, 5, 7, and 9 may be used in computing weighted precipitation intensities for other drainage basins. Form 5 is used for the first sheet and form 5a for all additional sheets required to record an individual storm.

Heading

The drainage basin and experimental area are inserted in the spaces provided. The standard and recording rain gage numbers are inserted for each determination of a recording gage correction factor. In determining the correction factor, the reading for the standard rain gage installed beside the recording gage is set down as the numerator of a fraction, the denominator of which is the total recorded rainfall. This fraction should be identical with that shown on form 3 for the same storm. The quotient, multiplied by the weight factor of the recording gage, which is also inserted, is the weighted correction factor to be applied to recorded values shown below. The correction factor shown at the right is the weighted mean precipitation for the drainage basin as obtained from form 2 (bottom of page) divided by the accumulated total precipitation at the end of the storm, as shown in column 11. This correction factor is used to obtain the weighted precipitation for the drainage basin shown in column 12.

Column 1. The date of the rainfall is inserted in column 1.

Column 2. The time in hours and minutes is recorded in column 2. Since two or more gages are combined, it is necessary to show the same time intervals for each gage. The interval to be used for any drainage area is the smallest time interval that

can be read accurately from the gage chart with the most contracted time scale. For example, if one gage can be read to 5 minutes, and another to 30 minutes, the time interval to be used in combining the reading would be 30 minutes. Regardless of the time interval selected, it should always start from an even hour and should not be broken; except for the first interval for each gage which will be the time from the actual beginning of rain to the end of the next regular interval. The first time listed in column 2 is the time rainfall begins at the recording gage which first registers rainfall for the storm in question.

Column 3. The data for column 3 are obtained from the original rain gage chart and are recorded as accumulated precipitation, corrected for instrumental errors, at the times listed in column 2.

Column 4. Each value in column 3 is multiplied by the recording rain gage correction factor shown at the top of the form to obtain the values for column 4.

Columns 5 to 10. These columns are treated in pairs the same as columns 3 and 4, for tabulating data from three additional recording gages.

Column 11. The figures in this column are the sums of the corrected accumulated values for all recording gages used for the drainage basin. Column 11 = column 4 + column 6 + column 8 - - - etc.

Column 12. The values of column 11 are corrected to the weighted mean precipitation for the drainage basin (obtained from form 2) and tabulated in column 12. The correction factor is shown at the top of form 5. Column 11 x correction factor = column 12.

Column 13. The differences between successive values in column 12 are recorded in column 13. This rainfall is the increment which occurred during the regular time interval.

Column 14. The values in column 13 are converted into inches per hour and recorded in column 14.

$$\frac{\text{Rainfall in inches (col. 13) x 60 minutes}}{\text{interval in minutes}} =$$

intensity in inches per hour (column 14).

Column 15. Column 15 is used to record notes and remarks opposite the times shown in column 2. Such observations as the beginning of precipitation (P.B.) and end of precipitation (P.E.) at each gage, along with any remarks pertinent to the entire record, are recorded in column 15.

Bottom of form. The bottom of form is executed according to the instructions given under "form 4". The storm duration is the total elapsed time from the beginning time of rainfall at the first gage to register rainfall to the time rainfall ends at the last gage.

N

AREA = 1876 70 ACRES

SRG 21
RRG 1
37 %
3000
3500
4000
SRG 2
RRG 5
40 %
2500
GAGING STATION NO. 8
0 %
SRG 19
RRG 6
4500
5000
3500
4000
3000
0 %
SRG 39
RRG 2
4500
23 %
SRG 6
RRG 3
0 %
RRG 4

LEGEND

○ RECORDING RAIN GAGE

○ STANDARD RAIN GAGE

42 % DRAINAGE AREA

APPALACHIAN FOREST EXPERIMENT STATION
ASHEVILLE, NORTH CAROLINA
RECORDING RAIN GAGE
SERVICE AREAS
DRAINAGE BASIN NO. 8
COWEETA EXPERIMENTAL FOREST
SCALE: 1" = 20 CH. = 1320 FT.
CONTOUR INTERVAL = 500 FT.

PLATE 3

RI-AP
Forests on Streamflow
Precipitation

U. S. Department of Agriculture
Forest Service

Form 5
File No. _____

WEIGHTED PRECIPITATION INTENSITY RECORD

Drainage basin No. _____ Experimental area: _____

S.R.G. No. / R.R.G. No. = ____ x ____ =
S.R.G. No. / R.R.G. No. = ____ x ____ =
S.R.G. No. / R.R.G. No. = ____ x ____ =
S.R.G. No. / R.R.G. No. = ____ x ____ =

W.M.P. / Col. 11 = ____ = ____

Date	Time	Gage No. __ Acc. depth		Gage No. __ Acc. depth		Gage No. __ Acc. depth		Gage No. __ Acc. depth		Sum	Weighted rainfall			Remarks
		Rec.	Corr.	Rec.	Corr.	Rec.	Corr.	Rec.	Corr.		Acc.	Incre.	Rate	
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
	Hr:min.	In.	In.	In.	In.	In.	In.	In.	In.	In.	In.	In.	In./hr.	

-30-

MAXIMUM DEPTH AND INTENSITY FOR SELECTED TIME INTERVALS

Duration min.	5	10	15	20	30	60	120
Depth in.							
Intensity in./hr.							

STORM DURATION

___ hrs.: ___ min.

Tabulated by _____ Date _____
Checked by _____ Date _____
Computed by _____ Date _____
Checked by _____ Date _____

Sheet ___ of ___ sheets

RI-AP
Forests on Streamflow
Precipitation

U. S. Department of Agriculture
Forest Service

Form 5a
File No. ________

WEIGHTED PRECIPITATION INTENSITY RECORD

Date	Time	Gage No. __ Acc. depth		Gage No. __ Acc. depth		Gage No. __ Acc. depth		Gage No. __ Acc. depth		Sum	Weighted rainfall			Remarks
		Rec.	Corr.	Rec.	Corr.	Rec.	Corr.	Rec.	Corr.		Acc.	Incre.	Rate	
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
	Hr:min.	In.	In.	In.	In.	In.	In.	In.	In.	In.	In.	In.	In./hr.	

Tabulated by: ____________ Date ____________ Checked by: ____________ Date ____________
Computed by: ____________ Date ____________ Checked by: ____________ Date ____________
Sheet ___ of ___ sheets

RI-AP
Forests on Streamflow
Precipitation

U. S. Department of Agriculture
Forest Service

Form 5
File No. _____

WEIGHTED PRECIPITATION INTENSITY RECORD

Drainage basin No. 8 Experimental area: Coweeta

S.R.G. No. 21 / R.R.G. No. 1 = 5.90 / 6.02 x 0.37 = .3626

S.R.G. No. 6 / R.R.G. No. 3 = 6.70 / 6.74 x 0.23 = .2286

S.R.G. No. 2 / R.R.G. No. 5 = 5.94 / 5.87 x 0.40 = .4048

S.R.G. No. / R.R.G. No. = ____ x ____ = ____

W.M.P. / Col. 11 = 5.80 / 6.10 = .951

Date	Time	Gage No. 1 Acc. depth		Gage No. 3 Acc. depth		Gage No. 5 Acc. depth		Gage No. __ Acc. depth		Sum	Weighted rainfall			Remarks
		Rec.	Corr.	Rec.	Corr.	Rec.	Corr.	Rec.	Corr.		Acc.	Incre.	Rate	
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
	Hr:min.	In.	In.	In.	In.	In.	In.	In.	In.	In.	In.	In.	In./hr.	
Sept.29	2:00a										0.00	0.00		P.B. Gage No. 3
1936	2:30			0.03	0.006					0.01	0.01	0.01	0.02	at 2:00 a.
	3:00			0.20	0.046					0.05	0.05	0.04	0.08	
	3:30			0.24	0.055					0.06	0.06	0.01	0.02	
	4:00			0.34	0.078					0.08	0.08	0.02	0.04	
	4:30			0.34	0.078					0.08	0.08	0.00	0.00	
	5:00			0.35	0.080					0.08	0.08	0.00	0.00	
	5:30			0.35	0.080					0.08	0.08	0.00	0.00	5:00 a. - 9:30 a.
	6:00			0.35	0.080					0.08	0.08	0.00	0.00	no rain
	6:30			0.35	0.080					0.08	0.08	0.00	0.00	
	7:00			0.35	0.080					0.08	0.08	0.00	0.00	
	7:30			0.35	0.080					0.08	0.08	0.00	0.00	
	8:00			0.35	0.080					0.08	0.08	0.00	0.00	
	8:30			0.35	0.080					0.08	0.08	0.00	0.00	
	9:00			0.35	0.080					0.08	0.08	0.00	0.00	
	9:30			0.35	0.080					0.08	0.08	0.00	0.00	
	10:00			0.37	0.085					0.08	0.08	0.00	0.00	
	10:30			0.37	0.085					0.08	0.08	0.00	0.00	

MAXIMUM DEPTH AND INTENSITY FOR SELECTED TIME INTERVALS

Duration min.	5	10	15	20	30	60	120
Depth in.					0.62	1.17	1.48
Intensity in./hr.					1.24	1.17	.74

STORM DURATION

34 hrs.:00min.

Tabulated by I. W. Date June 1939
Checked by _____ Date _____
Computed by I. W. Date June 1939
Checked by A. C. Date July 1939

Sheet 1 of 3 sheets

RI-AP
Forests on Streamflow
Precipitation

U. S. Department of Agriculture
Forest Service

Form 5a
File No. _____

WEIGHTED PRECIPITATION INTENSITY RECORD

Date	Time	Gage No. 1 Acc. depth		Gage No. 3 Acc. depth		Gage No. 5 Acc. depth		Gage No. ___ Acc. depth		Sum	Weighted rainfall			Remarks
		Rec.	Corr.	Rec.	Corr.	Rec.	Corr.	Rec.	Corr.		Acc.	Incre.	Rate	
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Sept.29	Hr:min.	In.	In.	In.	In.	In.	In.	In.	In.	In.	In.	In	In./hr.	
cont'd	11:00a			0.38	0.087					0.09	0.09	0.01	0.02	
	11:30			0.39	0.089					0.09	0.09	0.00	0.00	
	12:00			0.40	0.091					0.09	0.09	0.00	0.00	12:00 m. - 4:00 p.
	12:30p			0.40	0.091					0.09	0.09	0.00	0.00	no rain.
	1:00			0.40	0.091					0.09	0.09	0.00	0.00	
	1:30			0.40	0.091					0.09	0.09	0.00	0.00	
	2:00			0.40	0.091					0.09	0.09	0.00	0.00	
	2:30			0.40	0.091					0.09	0.09	0.00	0.00	
	3:00			0.40	0.091					0.09	0.09	0.00	0.00	
	3:30			0.40	0.091					0.09	0.09	0.00	0.00	
	4:00			0.40	0.091					0.09	0.09	0.00	0.00	
	4:30			0.40	0.091	0.23	0.093			0.18	0.17	0.08	0.16	P.B. Gage No. 5 at
	5:00			0.65	0.149	0.47	0.190			0.34	0.32	0.15	0.30	4:10 p.
	5:30	0.27	0.098	0.90	0.206	0.48	0.194			0.50	0.48	0.16	0.32	P.B. Gage No. 1 at
	6:00	0.33	0.120	0.90	0.206	0.49	0.198			0.52	0.49	0.01	0.02	5:10 p.
	6:30	0.34	0.123	0.97	0.222	0.59	0.239			0.58	0.55	0.06	0.12	
	7:00	0.40	0.145	1.08	0.247	0.69	0.279			0.67	0.64	0.09	0.18	
	7:30	0.50	0.181	1.19	0.272	0.80	0.324			0.78	0.74	0.10	0.20	
	8:00	0.60	0.218	1.30	0.297	0.88	0.356			0.87	0.83	0.09	0.18	
	8:30	0.70	0.254	1.38	0.315	1.15	0.466			1.04	0.99	0.16	0.32	
	9:00	0.92	0.334	2.04	0.466	1.59	0.644			1.44	1.37	0.38	0.76	
	9:30	1.74	0.631	2.52	0.576	2.09	0.846			2.05	1.95	0.58	1.16	
	10:00	2.35	0.852	3.00	0.686	2.59	1.048			2.59	2.46	0.51	1.02	
	10:30	2.57	0.932	3.27	0.748	2.97	1.202			2.88	2.74	0.28	0.56	
	11:00	2.86	1.037	3.55	0.812	3.34	1.352			3.20	3.04	0.30	0.60	
	11:30	3.32	1.204	4.05	0.926	4.27	1.728			3.86	3.67	0.63	1.24	
	12:00	4.40	1.595	4.54	1.038	4.43	1.793			4.43	4.21	0.54	1.08	

Tabulated by: _____ Date _____ Checked by: _____ Date _____
Computed by: _____ Date _____ Checked by: _____ Date _____

RI-AP
Forests on Streamflow
Precipitation

U. S. Department of Agriculture
Forest Service

Form 5a
File No. _____

WEIGHTED PRECIPITATION INTENSITY RECORD

Date	Time	Gage No. 1 Acc. depth		Gage No. 3 Acc. depth		Gage No. 5 Acc. depth		Gage No. __ Acc. depth		Sum	Weighted rainfall			Remarks
		Rec.	Corr.	Rec.	Corr.	Rec.	Corr.	Rec.	Corr.		Acc.	Incre.	Rate	
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
	Hr:min.	In.	In.	In.	In.	In.	In.	In.	In.	In.	In.	In.	In./hr.	
Sept.30	12:30a	4.57	1.657	5.09	1.164	4.49	1.818			4.64	4.41	0.20	0.40	
1936	1:00	4.66	1.690	5.16	1.180	4.54	1.838			4.71	4.48	0.07	0.14	
	1:30	4.71	1.708	5.21	1.191	4.71	1.907			4.81	4.57	0.09	0.18	
	2:00	4.79	1.737	5.27	1.205	4.93	1.996			4.94	4.70	0.13	0.26	
	2:30	5.01	1.817	5.48	1.253	5.19	2.101			5.17	4.92	0.22	0.44	
	3:00	5.31	1.925	5.84	1.335	5.59	2.263			5.52	5.25	0.33	0.66	
	3:30	5.51	1.998	6.18	1.413	5.63	2.279			5.69	5.41	0.16	0.32	
	4:00	5.71	2.070	6.47	1.479	5.70	2.307			5.86	5.57	0.16	0.32	
	4:30	5.94	2.154	6.52	1.491	5.75	2.328			5.97	5.68	0.11	0.22	
	5:00	5.97	2.165	6.57	1.502	5.79	2.344			6.01	5.72	0.04	0.08	
	5:30	6.00	2.176	6.60	1.509	5.81	2.352			6.04	5.74	0.02	0.04	
	6:00	6.02	2.183	6.64	1.518	5.82	2.356			6.06	5.76	0.02	0.04	P.E. Gage No. 1 at
	6:30		2.183	6.64	1.518	5.82	2.356			6.06	5.76	0.00	0.00	6:00 a.
	7:00		2.183	6.64	1.518	5.82	2.356			6.06	5.76	0.00	0.00	
	7:30		2.183	6.65	1.520	5.83	2.360			6.06	5.76	0.00	0.00	
	8:00		2.183	6.65	1.520	5.83	2.360			6.06	5.76	0.00	0.00	
	8:30		2.183	6.67	1.525	5.85	2.368			6.08	5.78	0.02	0.04	
	9:00		2.183	6.69	1.529	5.86	2.372			6.08	5.78	0.00	0.00	
	9:30		2.183	6.70	1.532	5.87	2.376			6.09	5.79	0.01	0.02	P.E. Gage No. 5 at
	10:00		2.183	6.72	1.536		2.376			6.10	5.80	0.01	0.02	9:30 a.
	10:30		2.183	6.72	1.536		2.376			6.10	5.80	0.00	0.00	
	11:00		2.183	6.73	1.539		2.376			6.10	5.80	0.00	0.02	
	11:30		2.183	6.73	1.539		2.376			6.10	5.80	0.00	0.00	
	12:00		2.183	6.74	1.541		2.376			6.10	5.80	0.00	0.00	P.E. Gage No. 3 at
														12:00 m.

Tabulated by: _____ Date _____ Checked by: _____ Date _____
Computed by: _____ Date _____ Checked by: _____ Date _____

Sheet 3 of 3 sheets

RECORD OF RUNOFF
Form 6

Purpose

This form is used in computing a continuous runoff record for an individual drainage basin. Data are broken down into time intervals of such lengths that the records may be used in the analysis of storms, water yield, baseflow accretion and depletion, infiltration, and storage or detention.

Procedure

To determine the total runoff by storms as well as by days, it is necessary to fix the end of a storm. This is accomplished as follows:

a. Determine a depletion curve for the six-month period (dormant or growing, as described on page 1) for each drainage basin. This curve is derived from all original stream gage charts for the six-month period. 2/ It represents the relation between head (or gage height) and time, both to the same scale as the original charts, and is a composite baseflow depletion curve uninfluenced by any phase of stormflow.

b. The stage-time depletion curve is then fitted to the lower end of the recession side of the stage hydrograph for the storm in question.

c. The time at which the depletion curve departs from the storm hydrograph is considered the end of the storm. The method is illustrated on plate 5.

2/ If it is necessary to obtain the end point of storms before a particular six-month record is available, it may be done by using an average depletion curve obtained from past records for the dormant or growing periods.

Form 6 is designed to permit accurate reproduction of the stream hydrograph. To keep the runoff error small, the time interval is limited by two factors: 1. the curvature of the stage hydrograph, and 2. the curvature of the stage-discharge relation. Both factors produce a cumulative error, the net result of which is usually over-estimated discharge. The error due to curvature of the stage hydrograph is eliminated by breaking the hydrograph into segments which do not have appreciable curvature while the error due to curvature of the stage-discharge relation is reduced by breaking the hydrograph into short intervals. An allowable error of one percent has been designated for runoff computations and to obtain this degree of accuracy, charts similar to plate 4 have been prepared. Referring to plate 4 for a 90 degree V-notch weir, the mean of the discharge at the beginning and at the ending of the interval is the mean discharge for the interval within one percent error if the curve of the interval (for 10, 20, etc. minutes) lies above the given combination of slope and mean head.

Plate 5 illustrates some of the features explained below in connection with the execution of form 6.

Top of form. Form 6 (with the complete heading) is used as the first page of a set of records covering each six-month period and the second form (6a) is used thereafter. All the information called for is inserted in the proper space.

Column 1. The date that runoff occurred is inserted here.

Column 2. The time of day at which the hydrograph is broken is recorded in hours and minutes to the nearest number of minutes that can be accurately read from the given chart (e.g. 2, 10, or 15 etc. minutes).

A break in the hydrograph is always made at midnight, at all peaks, at all troughs, and at definite changes in the slope of the hydrograph. In listing the times, a line is left blank preceding the time of the beginning of stormflow, likewise after midnight and after the end of stormflow.

Column 3. The time intervals in minutes between successive breaks (or between the times of col. 2) of the hydrograph are tabulated.

Column 4. Gage heights at the breaks of the hydrograph (or at the times shown in col. 2) are read from the hydrograph and recorded in column 4.

Column 5. Discharge rates in cubic feet per second for the gage heights of column 4 are obtained from the stage-discharge table for the measuring device 3/ employed, and are inserted in column 5.

Column 6. In column 6 are recorded the average discharge rates in c.f.s. for the time intervals of column 3. These values are obtained by averaging the successive discharge rates of column 5.

Column 7. The discharge rates of column 6 are converted into inches per hour and tabulated in column 7. These values are obtained by multiplying each of the column 6 figures by the conversion factor shown in the heading of form 6. The conversion factor =

$$\frac{3600 \times 12}{43{,}560 \times \text{drainage area in acres}}$$

3/ For the 90 degree V-notch weir used in the following example see H. W. King, Handbook of Hydraulics, table 48, pp. 141-144.

Column 8. Column 8 is used to record the runoff from the drainage basin in cubic feet for the time intervals of column 3. Column 8 = column 3 x column 6 x 60 sec.

Column 9. The runoff from the drainage basin in inches for the time intervals of column 3 are listed in column 9.

Column 9 = column 7 x $\frac{\text{column 3}}{60}$ or

$$\frac{\text{Column 8 x 12}}{\text{drainage area in acres x 43,560}}$$

Column 10. Column 10 shows the accumulated runoff from the drainage basin in cubic feet. It is obtained by adding the values in column 8 and recording the sum opposite the last figure added. Thus, any value in column 10 represents the total runoff from the starting point to the time shown in column 2. In order to show total runoff by storms as well as by days, starting points for accumulated runoff are always taken at the beginning and ending of storm runoff. They are also taken at each midnight when there is no stormflow. Accumulated runoff during a storm is carried beyond midnight to the end of stormflow in which case the daily total runoff is recorded on the blank line which follows each midnight. Total storm runoff is similarly recorded.

Column 11. The values in column 10 are converted into inches and recorded in column 11.

$$\text{Column 11} = \frac{\text{Column 10 x 12}}{\text{drainage area in acres x 43,560}}$$

Column 12. Column 12 is used for showing the mean daily discharge in cubic feet per second per square mile (c.s.m.) 4/

$$\text{Column 12} = \frac{\text{Column 10 (daily total) x 640}}{\text{drainage area in acres x 86,400}}$$

The maximum peak discharge rate in c.f.s. is converted to c.s.m. and also recorded in column 12.

Column 13. The remarks inserted in column 13 must include the following:

Storm (or surface) runoff begins (S.R.B.)

Peak (P) noted at each point where the hydrograph changes from a rising to a falling stage.

Maximum Peak (M.P.) the highest peak of the entire storm.

Trough (T) noted at each point where the hydrograph changes from a falling to a rising stage.

Storm (or surface) runoff ends (S.R.E.)

Column 13 is also used for recording any observations, remarks, or notes pertaining to the chart record or to any of the computations required in executing the form.

4/ The heading of this column is left blank so that any conversions or data required by other agencies may be inserted.

TIME INTERVALS FOR COMPUTING RUNOFF

FROM MEAN OF DISCHARGE AT BEGINNING AND AT ENDING OF INTERVALS

(ALLOWABLE ERROR OF ONE PERCENT - 90° V-NOTCH WEIR)

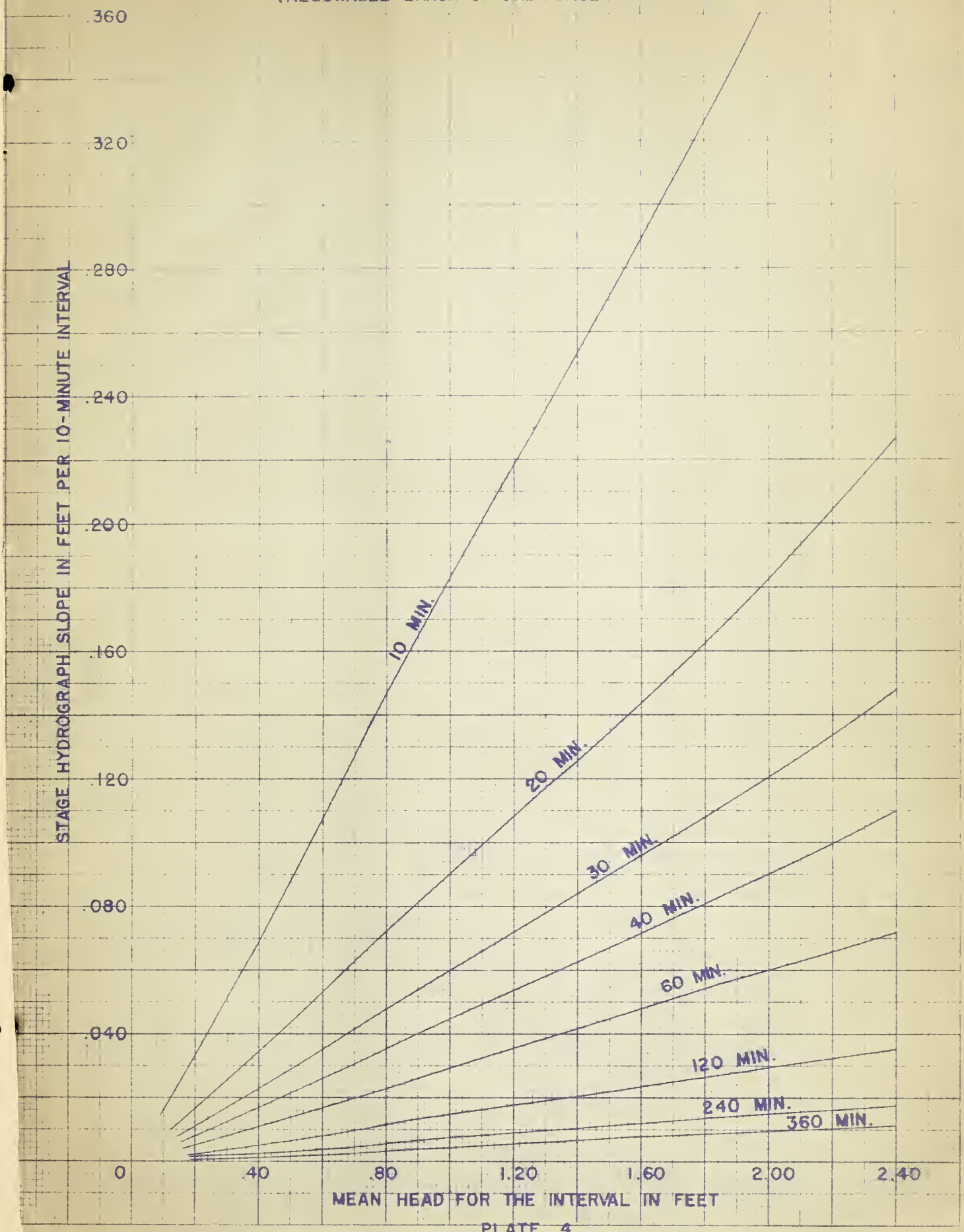

PLATE 4

SEPT. 28 | SEPT. 29 | SEPT. 30 | OCT. 1 | OCT. 2 | OCT. 3

PEAK DISCHARGE = 31.90 C.S.M.
MAXIMUM PEAK - M.P.

PEAK - P.

PEAK - P.

TROUGH - T.

TROUGH - T.

PEAK - P.

PEAK - P.

TROUGH - T.

TROUGH - T.

SURFACE RUNOFF BEGINS - S.R.B.

SURFACE RUNOFF ENDS - S.R.E.

GROUND-WATER DEPLETION CURVE

WATER LEVEL RECORDER EIGHT DAY CHART - VERTICAL SCALE 1" = 2

APPALACHIAN FOREST EXPERIMENT STATION
ASHEVILLE, NORTH CAROLINA

STAGE HYDROGRAPH
90° V-NOTCH WEIR

SEPT. 28 - OCT. 3, 1936

DRAINAGE NO. 7 - 145.5 ACRES
COWEETA EXPERIMENTAL FOREST

FOREST INFLUENCE INVESTIGATIONS —
PLATE 5

RI-AP
Forests on Streamflow
Runoff

U. S. Department of Agriculture
Forest Service

Form 6
File No. _____

RECORD OF RUNOFF

Station type: _____ (Current meter, flume, etc.)
Time Standard: EST CST MST PST (Cross out others)
Station description is - is not - available upon request. (Cross out one)
Gage datum elev. of zero flow _____ ft.
Conversion factor: 1 c.f.s. = _____ in./hr.

Elevation: _____ (Gage datum, MSL)
Gage type: _____
1 inch on chart = _____ ft.
1 inch on chart = _____ min. or hr.
Discharge rates from rating table dated: _____

_____ (Name of drainage area)
_____ (Station designation)
Lat.: ° ' ": Long.: ° ' "
Sec.: _____, Tp. _____, Range _____
Catchment area: _____ (Size: Ac. -- Sq. mi.) (Cross out one)

Date	Time	Time interval	Gage height	Discharge rate: For gage height	Discharge rate: Average for interval		Runoff from area: For interval		Runoff from area: Accumulated			Remarks
1	2	3	4	5	6	7	8	9	10	11	12	13
	Hr:min.	Min.	Ft.	C.f.s.	C.f.s.	In./hr.	Cu. ft.	Inches	Cu. ft.	Inches	C.s.m.	

Tabulated by: _____ Date _____ Checked by: _____ Date _____
Computed by: _____ Date _____ Checked by: _____ Date _____
Sheet ___ of ___ sheets

RI-AP
Forests on Streamflow
Runoff

U. S. Department of Agriculture
Forest Service

Form 6a
File No. _____

RECORD OF RUNOFF

Station designation: _____ Discharge rates from rating table dated: _____

Date	Time	Time interval	Gage height	Discharge rate			Runoff from area					Remarks
				For gage height	Average for interval		For interval		Accumulated			
1	2	3	4	5	6	7	8	9	10	11	12	13
	Hr:min.	Min.	Ft.	C.f.s.	C.f.s.	In./hr.	Cu. ft.	Inches	Cu. ft.	Inches	C.s.m.	

Tabulated by: _____ Date _____ Checked by: _____ Date _____
Computed by: _____ Date _____ Checked by: _____ Date _____

Sheet ___ of ___ sheets

RI-AP
Forests on Streamflow
Runoff

U. S. Department of Agriculture
Forest Service

Form 6a
File No. _____

RECORD OF RUNOFF

Station designation: Coweeta No. 7

Discharge rates from rating table dated: Dec. 1, 1934

Date	Time	Time interval	Gage height	Discharge rate: For gage height	Discharge rate: Average for interval		Runoff from area: For interval		Runoff from area: Accumulated			Remarks
1	2	3	4	5	6	7	8	9	10	11	12	13
	Hr:min.	Min.	Ft.	C.f.s.	C.f.s.	In./hr.	Cu. ft.	Inches	Cu. ft.	Inches	C.s.m.	
Sept.28	12:00	720	0.400	0.262	0.262	0.0018	11,318	0.0214	11,318	0.0214		
1936	2:00p	120	0.390	0.246	0.254	0.0017	1,829	0.0035	13,147	0.0247		
	5:00	180	0.386	0.240	0.243	0.0017	2,624	0.0050	15,771	0.0299		
	9:00	240	0.398	0.259	0.250	0.0017	3,600	0.0068	19,371	0.0367		
	12:00	180	0.400	0.262	0.260	0.0018	2,808	0.0053	22,179	0.0420		
									22,179	0.0420	1.13	Sept.28 total = 22,179
Sept.29	2:00a	120	0.402	0.265	0.264	0.0018	1,901	0.0036	1,901	0.0036		S.R.B. 2:00 a.
	3:00	60	0.438	0.328	0.296	0.0020	1,066	0.0020	1,066	0.0020		
	3:40	40	0.491	0.435	0.382	0.0026	917	0.0017	1,983	0.0038	1.9140	M.P. 3:40 a.
	4:00	20	0.437	0.326	0.380	0.0026	456	0.0009	2,439	0.0046		
	4:30	30	0.455	0.360	0.343	0.0023	617	0.0012	3,056	0.0058		
	6:00	90	0.413	0.284	0.322	0.0022	1,739	0.0033	4,795	0.0091		
	6:20	20	0.428	0.310	0.297	0.0020	356	0.0007	5,151	0.0098		
	6:40	20	0.408	0.275	0.292	0.0020	350	0.0007	5,501	0.0104		
	7:30	50	0.406	0.272	0.274	0.0019	822	0.0016	6,323	0.0120	1.4051	S.R.E. 7:30 a.
												Total stormflow
	9:00	90	0.383	0.236	0.254	0.0017	1,372	0.0026	1,372	0.0026		6,323
	12:00	180	0.370	0.216	0.226	0.0015	2,441	0.0046	3,813	0.0072		
	2:00p	120	0.368	0.213	0.214	0.0015	1,541	0.0029	5,354	0.0101		
	5:30	210	0.370	0.216	0.214	0.0015	2,696	0.0051	8,050	0.0152		S.R.B. 5:30 p.

Tabulated by: H. K. S. Date May 1938 Checked by: K. A. M. Date May 1938
Computed by: I. W. Date May 1939 Checked by: A. C. Date May 1939

RI-AP
Forests on Streamflow
Runoff

U. S. Department of Agriculture
Forest Service

Form 6a
File No. _____

RECORD OF RUNOFF

Station designation: Coweeta No. 7

Discharge rates from rating table dated: Dec. 1, 1934

Date	Time	Time interval	Gage height	Discharge rate: For gage height	Discharge rate: Average for interval		Runoff from area: For interval		Runoff from area: Accumulated			Remarks
1	2	3	4	5	6	7	8	9	10	11	12	13
	Hr:min.	Min.	Ft.	C.f.s.	C.f.s.	In./hr.	Cu. ft.	Inches	Cu. ft.	Inches	C.s.m.	
Sept.29	5:40p	10	0.400	0.262	0.239	0.0016	143	0.0003	143	0.0002		
1936	6:00	20	0.450	0.351	0.306	0.0021	367	0.0007	510	0.0010		
	6:20	20	0.477	0.405	0.378	0.0026	454	0.0009	964	0.0018		
	6:40	20	0.500	0.455	0.430	0.0029	516	0.0010	1,480	0.0028		
	7:00	20	0.480	0.411	0.433	0.0030	520	0.0010	2,000	0.0038		
	7:30	30	0.470	0.390	0.400	0.0027	720	0.0014	2,720	0.0052		
	8:00	30	0.488	0.428	0.409	0.0028	736	0.0014	3,456	0.0065		
	8:30	30	0.530	0.525	0.476	0.0032	857	0.0016	4,313	0.0082		
	8:45	15	0.536	0.540	0.532	0.0036	479	0.0009	4,792	0.0091		
	9:00	15	0.600	0.714	0.627	0.0043	564	0.0011	5,356	0.0101		
	9:10	10	0.780	1.364	1.039	0.0071	623	0.0012	5,979	0.0113		
	9:20	10	0.852	1.697	1.530	0.0104	918	0.0017	6,897	0.0131		
	9:40	20	1.000	2.520	2.108	0.0144	2,530	0.0048	9,427	0.0179		
	10:00	20	1.118	3.319	2.920	0.0199	3,504	0.0066	12,931	0.0245		P. 10:00 p.
	10:30	30	1.060	2.910	3.114	0.0212	5,605	0.0106	18,536	0.0351		
	11:00	30	0.948	2.209	2.560	0.0175	4,608	0.0087	23,144	0.0438		T. 11:00 p.
	11:20	20	1.020	2.646	2.428	0.0166	2,914	0.0055	26,058	0.0494		
	11:40	20	1.100	3.189	2.918	0.0199	3,502	0.0066	29,560	0.0560		
	12:00	20	1.343	5.221	4.205	0.0287	5,046	0.0096	34,606	0.0655		
									50,880	0.0964	2.59	Total Sept. 29 = 50,880
Sept.30	12:10a	10	1.534	7.251	6.236	0.0425	3,742	0.0071	38,348	0.0726	31.9044	M.P. 12:10 a.
	12:30	20	1.401	5.796	6.524	0.0445	7,829	0.0148	46,177	0.0875		

Tabulated by: _____ Date _____ Checked by: _____ Date _____
Computed by: _____ Date _____ Checked by: _____ Date _____

Sheet 2 of 4 sheets

RI-AP
Forests on Streamflow
Runoff

U. S. Department of Agriculture
Forest Service

Form 6a
File No. _____

RECORD OF RUNOFF

Station designation: Coweeta No. 7

Discharge rates from rating table dated: Dec. 1, 1934

Date	Time	Time interval	Gage height	Discharge rate: For gage height	Discharge rate: Average for interval		Runoff from area: For interval		Runoff from area: Accumulated			Remarks
1	2	3	4	5	6	7	8	9	10	11	12	13
	Hr:min.	Min.	Ft.	C.f.s.	C.f.s.	In./hr.	Cu. ft.	Inches	Cu. ft.	Inches	C.s.m.	
Sept.30	1:00a	30	1.200	3.953	4.874	0.0332	8,773	0.0166	54,950	0.1041		
1936	2:00	60	0.980	2.397	3.175	0.0217	11,430	0.0216	66,380	0.1257		
	2:20	20	0.970	2.337	2.367	0.0161	2,840	0.0054	69,220	0.1311		T. 2:20 a.
	3:00	40	1.100	3.189	2.763	0.0188	6,631	0.0126	75,851	0.1437		
	3:10	10	1.108	3.247	3.218	0.0219	1,931	0.0037	77,782	0.1473		
	3:30	20	1.090	3.118	3.182	0.0217	3,818	0.0072	81,600	0.1546		
	3:50	20	1.172	3.730	3.424	0.0234	4,109	0.0078	85,709	0.1623		P. 3:50 a.
	4:10	20	1.140	3.483	3.606	0.0246	4,327	0.0082	90,036	0.1705		
	4:30	20	1.168	3.698	3.590	0.0245	4,308	0.0082	94,344	0.1787		
	5:00	30	1.120	3.334	3.516	0.0240	6,329	0.0120	100,673	0.1907		
	6:00	60	1.021	2.653	2.994	0.0204	10,778	0.0204	111,451	0.2111		
	7:00	60	0.925	2.079	2.366	0.0161	8,518	0.0161	119,969	0.2272		
	8:00	60	0.860	1.736	1.908	0.0130	6,869	0.0130	126,838	0.2402		
	9:00	60	0.807	1.484	1.610	0.0110	5.796	0.0110	132,634	0.2512		
	10:00	60	0.764	1.296	1.390	0.0095	5,004	0.0095	137,638	0.2607		
	12:00	120	0.710	1.081	1.188	0.0081	8,554	0.0162	146,192	0.2769		
	2:00p	120	0.668	0.930	1.006	0.0069	7,243	0.0137	153,435	0.2906		
	5:00	180	0.612	0.749	0.840	0.0057	9,072	0.0172	162,507	0.3078		
	8:00	180	0.576	.0.645	0.697	0.0048	7,528	0.0143	170,035	0.3220		
	12:00	240	0.548	0.570	0.608	0.0041	8,755	0.0166	178,790	0.3386		
									144,184	0.2731	7.34	Total Sept. 30 = 144,184

Tabulated by: _____ Date _____ Checked by: _____ Date _____
Computed by: _____ Date _____ Checked by: _____ Date _____

Sheet 3 of 4 sheets

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RI-AP
Forests on Streamflow
Runoff

U. S. Department of Agriculture
Forest Service

Form 6a
File No. _____

RECORD OF RUNOFF

Station designation: Coweeta No. 7

Discharge rates from rating table dated: Dec. 1, 1934

Date	Time	Time interval	Gage height	Discharge rate: For gage height	Discharge rate: Average for interval		Runoff from area: For interval		Runoff from area: Accumulated			Remarks
1	2	3	4	5	6	7	8	9	10	11	12	13
	Hr:min.	Min.	Ft.	C.f.s.	C.f.s.	In./hr.	Cu. ft.	Inches	Cu. ft.	Inches	C.s.m.	
Oct. 1	6:00a	360	0.516	0.492	0.531	0.0036	11,470	0.0217	190,260	0.3604		
1936	12:00	360	0.493	0.439	0.466	0.0032	10,066	0.0191	200,326	0.3794		
	12:00	720	0.465	0.380	0.410	0.0028	17,712	0.0335	218,038	0.4130		S.R.E. 12:00 mdt.
									218,038	0.4130	5.5394	Stormflow=218,038
									39,248	0.0743	2.00	Total Oct.1 =
												39,248
Oct. 2	11:00a	660	0.450	0.351	0.366	0.0025	14,494	0.0275	14,494	0.0274		
	3:00p	240	0.439	0.330	0.340	0.0023	4,896	0.0093	19,390	0.0367		
	12:00	540	0.438	0.328	0.329	0.0022	10,660	0.0202	30,050	0.0569		
									30,050	0.0569	1.53	Total Oct. 2 =
												30,050
Oct. 3	10:00a	600	0.431	0.315	0.322	0.0022	11,592	0.0220	11,592	0.0220		
	3:00p	300	0.420	0.296	0.306	0.0021	5,508	0.0104	17,100	0.0324		
	12:00	540	0.422	0.299	0.298	0.0020	9,655	0.0183	26,755	0.0507		
									26,755	0.0507	1.36	Total Oct. 3 =
												26,755

Tabulated by: _____ Date _____ Checked by: _____ Date _____

Computed by: _____ Date _____ Checked by: _____ Date _____

DRAINAGE DISCHARGE DATA
Forms 7 and 7a

Purpose

These forms are used for summarizing discharge data.

Procedure

Form 7 is for the growing season, May 1 to October 31, and form 7a is for the dormant season, November 1 to April 30. The mean discharge in c.f.s. per square mile (c.s.m.) is obtained from column 12, form 6, and tabulated for each day. These data are plotted as a continuous streamflow hydrograph, plate 6, which in turn is used as a guide in estimating missing records and as a basis for streamflow analysis.

At the bottom of the page the data are summarized by months, seasons, and years as follows:

Total (Σ): The summation of the daily discharges for the month, season, and year. This figure has no significance but is used in the computations which follow.

Mean: Mean daily c.s.m. for the period =

$$\frac{\Sigma \text{ Mean daily discharge}}{\text{number of days}}$$

Area inches: The volume of runoff expressed as inches depth on the drainage area.

$$\frac{(\Sigma \text{ mean daily discharge}) \times 86{,}400 \text{ sec.}}{2{,}323{,}200}$$

2,323,200 cubic feet = one-inch depth on one square mile.

Inches precipitation: The weighted mean precipitation on the drainage basin taken from form 2.

Runoff as a percent of the precipitation = $\frac{\text{Area inches}}{\text{inches precipitation}}$

JANUARY FEBRUARY MARCH APRIL MAY JUNE JULY AUGUST SEPTEMBER OCTOBER NOVEMBER DECEMBER

5 10 15 20 25

1936 STREAM HYDROGRAPH
Mean c.s.m. per day
Drainage No. 7
Area 145.5 acres
Coweeta Experimental Forest

90 80 70 60 50 40 30 20 10 9 8 7 6 5 4 3 2 1 .9 .8 .7 .6 .5 .4 .3 .2 .1

Mean discharge per day - C.s.m.

JANUARY FEBRUARY MARCH APRIL MAY JUNE JULY AUGUST SEPTEMBER OCTOBER NOVEMBER DECEMBER

Plate F

RI-AP
Forests on Streamflow
Runoff

U. S. Department of Agriculture
Forest Service

Form 7

DRAINAGE DISCHARGE DATA
Mean c.s.m. by Days, Months, and
Growing Season

Experimental area: _____ Computed by: _____
Drainage basin No. _____ Area: _____ acres Checked by: _____

Date	May	June	July	August	September	October
1						
2						
3						
4						
5						
6						
7						
8						
9						
10						
11						
12						
13						
14						
15						
16						
17						
18						
19						
20						
21						
22						
23						
24						
25						
26						
27						
28						
29						
30						
31						
Total						
Mean						
Area inches						
In. precipitation						
Runoff % of pre.						

	For 6 months ending Oct. 31	For 12 months ending Oct. 31
Total	_____	_____
Mean	_____	_____
Area inches	_____	_____
In. precipitation	_____	_____
Runoff % of pre.	_____	_____

Period: May 1, ____ to October 31, ____

RI-AP
Forests on Streamflow
Runoff

U. S. Department of Agriculture
Forest Service

Form 7a

DRAINAGE DISCHARGE DATA
Mean c.s.m. by Days, Months, and
Dormant Season

Experimental area: _____ Computed by: _____
Drainage basin No. _____ Area: _____ acres Checked by: _____

Date	November	December	January	February	March	April
1						
2						
3						
4						
5						
6						
7						
8						
9						
10						
11						
12						
13						
14						
15						
16						
17						
18						
19						
20						
21						
22						
23						
24						
25						
26						
27						
28						
29						
30						
31						
Total						
Mean						
Area inches						
In. precipitation						
Runoff % of pre.						

	For 6 months ending April 30	For 12 months ending April 30
Total	_____	_____
Mean	_____	_____
Area inches	_____	_____
In. precipitation	_____	_____
Runoff % of pre.	_____	_____

Period: November 1, ____ to April 30, ____

RI-AP
Forests on Streamflow
Runoff

U. S. Department of Agriculture
Forest Service

Form 7

DRAINAGE DISCHARGE DATA
Mean c.s.m. by Days, Months, and
Growing Season

Experimental area: Coweeta — Computed by: H.K.S.
Drainage basin No. 7 — Area: 145.5 acres — Checked by: K.A.M.

Date	May	June	July	August	September	October
1	5.29	2.61	1.76	1.87	1.06	2.03
2	5.14	2.56	3.04	1.65	1.06	1.53
3	5.28	2.51	1.97	1.50	1.56	1.36
4	4.88	2.85	2.20	1.40	1.17	1.27
5	4.68	2.54	1.76	1.36	1.08	1.23
6	4.73	2.49	1.73	1.31	1.06	1.26
7	4.48	2.44	1.67	1.35	1.04	1.34
8	4.33	2.48	1.63	1.30	1.02	1.52
9	4.22	2.43	1.67	1.27	1.05	1.70
10	4.13	2.70	1.64	1.30	1.05	1.83
11	4.81	2.48	1.68	1.23	1.01	1.49
12	4.87	2.84	2.56	1.19	1.02	1.38
13	4.24	2.47	2.03	1.18	0.98	1.34
14	4.07	2.29	1.78	1.17	0.96	1.28
15	3.94	2.23	1.68	1.16	0.99	1.26
16	3.83	2.13	1.64	1.14	0.95	1.63
17	3.72	2.06	1.94	1.17	0.95	1.35
18	3.54	2.10	1.67	1.09	0.92	1.28
19	3.59	2.07	1.58	1.35	1.03	1.24
20	3.45	2.06	1.56	1.14	1.70	1.22
21	3.45	2.01	1.65	1.10	1.08	1.20
22	3.25	1.99	1.51	1.07	0.98	1.21
23	3.14	2.00	1.49	1.12	0.95	1.64
24	3.11	1.96	1.50	1.45	1.12	1.30
25	3.03	1.87	1.47	1.23	1.00	1.26
26	2.96	1.84	1.42	1.15	1.00	1.34
27	3.06	1.76	1.38	1.11	1.04	1.25
28	2.89	1.73	1.36	1.27	1.13	1.22
29	2.80	1.69	1.37	1.34	2.59	1.20
30	2.75	1.65	1.82	1.15	7.44	1.17
31	2.67		1.81	1.09		1.15
Total	120.33	66.84	53.97	39.21	39.99	42.48
Mean	3.88	2.23	1.74	1.26	1.33	1.37
Area inches	4.48	2.49	2.01	1.46	1.49	1.58
In. precipitation	2.62	4.02	7.87	4.30	10.14	4.67
Runoff % of pre.	171.0	61.9	25.5	34.0	14.7	33.8

	For 6 months ending Oct. 31	For 12 months ending Oct. 31
Total	362.82	1150.34
Mean	1.97	3.14
Area inches	13.49	42.78
In. precipitation	33.62	83.03
Runoff % of pre.	40.1	51.5

Period: May 1, 1936 to October 31, 1936

RI-AP
Forests on Streamflow
Runoff

U. S. Department of Agriculture
Forest Service

Form 7a

DRAINAGE DISCHARGE DATA
Mean c.s.m. by Days, Months, and
Dormant Season

Experimental area: Coweeta — Computed by: H.K.S.
Drainage basin No. 7 — Area: 145.5 acres — Checked by: K.A.M.

Date	November	December	January	February	March	April
1	1.15	1.11	5.69	5.44	4.53	3.23
2	1.14	1.19	9.47	5.20	4.42	3.20
3	1.15	1.48	11.75	5.05	4.40	3.19
4	1.41	1.18	7.55	4.92	4.40	3.56
5	1.23	1.14	6.62	4.80	4.28	4.68
6	1.26	1.84	6.08	4.62	4.16	4.43
7	1.22	3.19	5.53	4.93	4.16	3.97
8	1.22	1.88	5.11	4.93	4.32	4.67
9	1.16	1.58	4.74	7.19	4.07	4.45
10	1.14	1.48	4.45	6.41	4.00	4.10
11	1.14	1.58	4.40	5.56	3.93	3.91
12	1.40	1.44	4.35	5.20	3.82	3.72
13	1.15	1.38	4.24	5.14	3.80	3.62
14	1.12	1.38	4.09	5.08	3.88	3.60
15	1.12	1.39	5.02	4.90	4.10	3.58
16	1.10	1.41	4.52	4.85	3.94	3.35
17	1.12	1.35	4.71	4.59	3.85	3.22
18	1.12	1.55	6.07	4.59	3.83	3.15
19	1.10	5.03	7.53	4.43	3.69	3.14
20	1.07	3.58	6.91	5.69	3.66	3.11
21	1.05	2.62	6.23	6.03	3.58	3.30
22	1.06	2.25	5.74	5.60	3.47	3.29
23	1.06	2.03	5.45	5.26	3.43	3.23
24	1.07	1.92	5.40	5.11	3.77	3.69
25	1.06	1.83	6.34	4.90	3.82	5.89
26	1.05	1.76	5.78	4.74	3.61	4.42
27	1.02	1.75	5.44	4.66	3.53	3.97
28	1.03	1.92	5.61	4.64	3.39	3.89
29	1.03	2.69	5.27		3.32	4.74
30	1.02	2.83	5.08		3.27	4.34
31		8.59	5.64		3.23	
Total	33.97	66.35	180.81	144.46	119.66	114.64
Mean	1.13	2.14	5.83	5.16	3.86	3.82
Area inches	1.26	2.47	6.72	5.37	4.45	4.26
In. precipitation	1.60	10.62	12.27	5.63	2.81	7.33
Runoff % of pre.	78.8	23.3	54.8	95.4	158.4	58.1

	For 6 months ending April 30	For 12 months ending April 30
Total	659.89	1022.71
Mean	3.65	2.80
Area inches	24.54	28.03
In. precipitation	40.26	73.88
Runoff % of pre.	61.0	51.5

Period: November 1, 1936 to April 30, 1937

SUMMARY OF PRECIPITATION AND RUNOFF BY STORMS
Form 8

Purpose

The purpose of this form is to present an annual summary of hydrologic data compiled for each drainage basin and arranged by individual storms. Information so arranged has been exceptionally useful in selecting storms for individual hydrograph analysis and also for scientific investigations of runoff characteristics.

Procedure

Form 8 contains a descriptive heading which is completely filled in from data kept in the drainage basin files. This form is used as the first sheet of an annual summary; successive sheets are executed on form 8a which does not contain the detailed heading. Most of the data for form 8 have been previously recorded and can be taken from the individual forms. The source of the data is as follows:

	HEADING OR DESCRIPTION	SOURCE OF DATA
Column 1.	Date (or dates) of storms	Form 4 or 5, col. 1
	Precipitation	Form 4 (case 1) or Form 5 (case 2)
Column 2.	Began (time of day to hr. and min.)	Form 4, col. 2, designated P.B. in col. 8. Form 5, col. 2, designated P.B. in col. 15. (use gage first recording precipitation)
Column 3.	Duration (hr. and min.)	Form 4 or 5, col. 2 elapsed time from P.B. to P.E. (first P.B. to last P.E. on form 5)

	HEADING OR DESCRIPTION	SOURCE OF DATA
Column 4.	Amount (total weighted precipitation for the storm)	Form 4, col. 5, designated P.E. in col. 8. Form 5, col. 12, last P.E. designated in col. 15.
Column 5.	Maximum 5 min. intensity	Forms 4 and 5, bottom of page.
Column 6.	Maximum 15 min. intensity	Do
Column 7.	Maximum 30 min. intensity	Do
Column 8.	Maximum 60 min. intensity	Do
	Runoff	Form 6
Column 9.	Began (time of day to hr. and min.)	Form 6, col. 2, designated S.R.B. in col. 13.
Column 10.	Duration (hrs. and min.)	Form 6, col. 2, elapsed time between S.R.B. and S.R.E.
Column 11.	Amount (total inches)	Form 6, col. 11, designated S.R.E. in col. 13.
Column 12.	Maximum rate (maximum peak for the storm)	Form 6, col. 5, designated M.P. in col. 13.
Column 13.	Time of maximum peak (elapsed time after beginning of rainfall)	Forms 8 and 6, elapsed time from form 8, col. 2 to form 6, col. 2 (M.P.)
Column 14.	Temperature (°F, average of max. and min. If storm lasts longer than 1-1/2 days average daily temperatures are averaged)	Form "climate, air, temperatures" - average of cols. 4 and 9.
Column 15.	Remarks (any notes, observations, or remarks relating to precipitation or runoff for the storm)	Forms 4 (or 5) and 6, cols. 8 (or 15) and 13. Supplemented.

RI-AP
Forests on Streamflow
Precipitation - Runoff

U. S. Department of Agriculture
Forest Service

Form 8
File No. _____

SUMMARY OF PRECIPITATION AND RUNOFF BY STORMS
FOR THE YEAR ENDING _____, 19 __

Characteristics of drainage area:
Size: _____ acres or sq. mi. (Cross out one)
Slope: Aver. _____ % Range _____ %
Elev., MSL _____ to _____ ft.
Soil types: _____
(Names and percentages of area)
Cover: _____
Percent of area: Cultivated-Meadow-Pasture-Woods-Other
Precipitation stations: _____
(Number and type)
Period of time covered by record: _____

Drainage basin: _____
Station designation: _____
Lat.: ____° ____' ____": Long.: ____° ____' ____"
Runoff Station: _____
Type (Current meter, flume, etc.)
Station description is - is not - available upon request.
(Cross out one)
Additional data available: _____
Tabulated by: _____ Date _____
Checked by: _____ Date _____

Date	Precipitation							Runoff					Tem-perature**	Remarks
	Time		Am't.	Maximum intensity				Time		Am't.	Max. rate	Time of max.*		
	Began	Duration		5 min.	15 min.	30 min.	60 min.	Began	Duration					
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
	Hr:min.	Hr:min.	In.	In/hr.	In/hr.	In/hr.	In/hr.	Hr:min.	Hr:min.	In.	C.f.s.	Hr:min.	Deg.F.	

* Elapsed time after beginning of rain. ** Average, of maximum and minimum.

Sheet ___ of ___ sheets

RI-AP
Forests on Streamflow
Precipitation - Runoff

U. S. Department of Agriculture
Forest Service

Form 8a
File No. ______

SUMMARY OF PRECIPITATION AND RUNOFF BY STORMS
FOR THE YEAR ENDING __________, 19 __

Station designation: ______________ Tabulated by: ______ Date ______ Checked by: ______ Date ______

Date	Precipitation							Runoff					Temperature**	Remarks
	Time		Am't.	Maximum intensity				Time		Am't.	Max. rate	Time* of max.		
	Began	Duration		5 min.	15 min.	30 min.	60 min.	Began	Duration					
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
	Hr:min.	Hr:min.	In.	In/hr.	In/hr.	In/hr.	In/hr.	Hr:min.	Hr:min.	In.	C.f.s.	Hr:min.	Deg.F.	

* Elapsed time after beginning of rain. ** Average, of maximum and minimum.

Sheet __ of __ sheets

RI-AP
Forests on Streamflow
Precipitation - Runoff

U. S. Department of Agriculture
Forest Service

Form 8
File No. _____

SUMMARY OF PRECIPITATION AND RUNOFF BY STORMS
FOR THE YEAR ENDING April 30, 19 37

Characteristics of drainage area:
Size: 145.5 acres or ~~sq.-mi.~~ (Cross out one)
Slope: Aver. 21 % Range 32.8 %
Elev., MSL 2370 to 3510 ft.
Soil types: Hayesville, fine sandy loam 100%
(Names and percentages of area)
Cover: 100% forested
Percent of area: Cultivated-Meadow-Pasture-Woods-Other
Precipitation stations: 1 recording - 5 standard rain gages
(Number and type)
Period of time covered by record: July 31, 1934 - present

Drainage basin: Coweeta
Station designation: 7
Lat.: 35 ° 3 ' 18 ": Long.: 83 ° 26 ' 24 "
Runoff Station: 90 degree V-notch weir
Type (Current meter, flume, etc.)
Station description is - ~~is not~~ - available upon request.
(Cross out one)
Additional data available: Climate - well records
Tabulated by: I. W. Date June 1939
Checked by: A. C. Date July 1939

Date	Precipitation							Runoff					Temperature**	Remarks
	Time		Am't.	Maximum intensity				Time		Am't.	Max. rate	Time of max.*		
	Began	Duration		5 min.	15 min.	30 min.	60 min.	Began	Duration					
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
1936	Hr:min.	Hr:min.	In.	In/hr.	In/hr.	In/hr.	In/hr.	Hr:min.	Hr:min.	In.	C.f.s.	Hr:min.	Deg.F.	
May 3	3:00p	:25	0.51	3.85	1.89	1.02	0.51	3:00p	4:00	0.038	1.985	:40	62.8	
May 11-12	1:50p	12:35	2.00	2.83	2.10	1.75	1.26	1:50p	24:30	0.207	3.132	:50	67.2	
June 4	2:25p	1:15	0.87	4.02	2.87	1.51	0.86	2:25p	5:30	0.034	1.880	:45	70.7	
June 10	5:50p	:50	0.79	2.11	1.72	1.40	1.04	5:50p	4:20	0.028	2.018	:55	69.2	
June 12	12:35p	2:45	0.92	2.84	2.55	1.69	0.87	12:35p	11:00	0.059	2.278	2:30	68.5	
July 3	3:55a	:55	0.51	1.69	1.24	0.69	0.51	4:05a	8:00	0.027	1.033	1:45	70.6	
July 3-4			1.16	No record				6:00p	24:00	0.084	0.917		72.6	
July 12	2:05p	1:10	1.83	6.94	4.52	3.03	1.74	2:10p	10:00	0.060	1.525	1:05	74.2	
July 13	2:50p	2:25	0.50	3.60	1.44	0.72	0.36	2:50p	5:30	0.022	0.986	:15	74.5	
July 17	12:35p	:20	0.78	3.38	2.63	1.56	0.78	12:35p	5:30	0.024	1.484	:40	72.8	
July 30-31	5:10a	25:55	1.74	1.07	0.64	0.40	0.30	5:15a	31:00	0.095	0.948	18:15	68.8	
Aug. 1	12:50a	20:55	0.88	0.25	0.21	0.17	0.12	12:50p	24:00	0.070	0.538	3:40	59.4	
Aug. 19	2:55p	3:15	0.85	2.36	1.74	1.33	0.70	3:00p	8:00	0.024	1.085	2:20	76.0	
Aug. 24	8:10p	1:15	0.93	3.09	2.36	1.58	0.87	8:15p	6:00	0.025	1.558	1:20	72.2	
Aug.28-29	1:10p	12:50	0.65	0.78	0.50	0.44	0.34	1:10p	14:40	0.035	0.533	3:20	74.2	

* Elapsed time after beginning of rain. ** Average, of maximum and minimum.

RI-AP
Forests on Streamflow
Precipitation - Runoff

U. S. Department of Agriculture
Forest Service

Form 8a
File No. _____

SUMMARY OF PRECIPITATION AND RUNOFF BY STORMS
FOR THE YEAR ENDING April 30 , 19 37

Station designation: Coweeta No. 7 Tabulated by: I. W. Date June 1939 Checked by: A. C. Date July 1939

Date	Precipitation							Runoff					Temperature**	Remarks
	Time		Am't.	Maximum intensity				Time		Am't.	Max. rate	Time of max.*		
	Began	Duration		5 min.	15 min.	30 min.	60 min.	Began	Duration					
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
1936	Hr:min.	Hr:min.	In.	In/hr.	In/hr.	In/hr.	In/hr.	Hr:min.	Hr:min.	In.	C.f.s.	Hr:min.	Deg.F.	
Sept. 3	6:15a	13:00	1.19	3.82	1.58	0.97	0.51	6:25a	9:00	0.029	1.037	6:25	70.2	
Sept. 20	1:25p	3:50	1.87	5.42	4.36	2.55	1.51	1:30p	10:30	0.044	3.006	1:35	67.8	
Sept. 24	6:10a	8:15	0.57	1.82	0.80	0.48	0.24	6:10a	13:00	0.025	0.530	4:10	67.2	Peak runoff
Sept.29-30	5:10p	12:50	5.94	3.36	2.84	2.09	1.53	5:30p	54:30	0.413	7.251	7:00	69.4	preceded peak
Oct. 6-9	10:00p	57:00	1.57	1.23	0.64	0.35	0.21	10:00p	66:00	0.154	0.553	43:25	69.2	rainfall
Oct. 9-10	11:20p	4:30	0.56	1.09	0.68	0.44	0.29	12:00	18:00	0.053	0.737	2:00	67.0	
Oct. 16	3:10a	11:00	0.93	0.71	0.52	0.40	0.22	3:30a	24:00	0.061	0.610	10:40	63.2	
Oct. 22-23	10:50p	6:30	0.95	2.38	1.11	0.67	0.37	11:00p	20:00	0.53	0.640	2:10	65.1	

* Elapsed time after beginning of rain. ** Average, of maximum and minimum.

Sheet 2 of 2 sheets